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G. B. HAZELWOOD ET AL

3,822,336

METHOD FOR FORMING A MASONRY WALL PANEL

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2 Sheets-Sheet 1

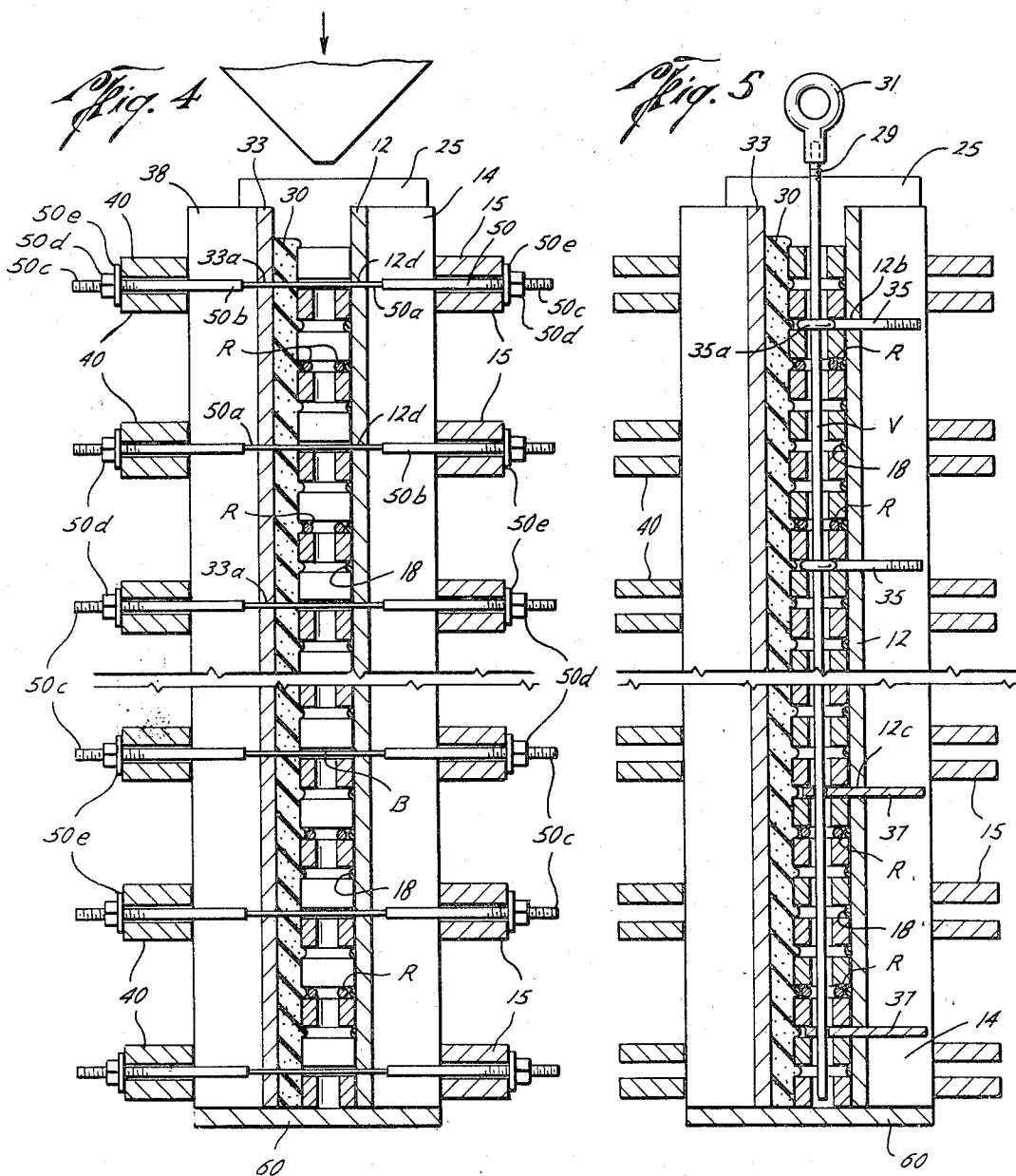


Fig. 6

Fig. 7

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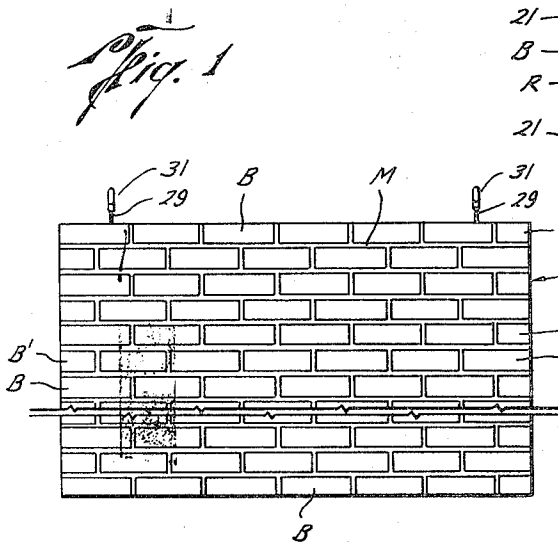
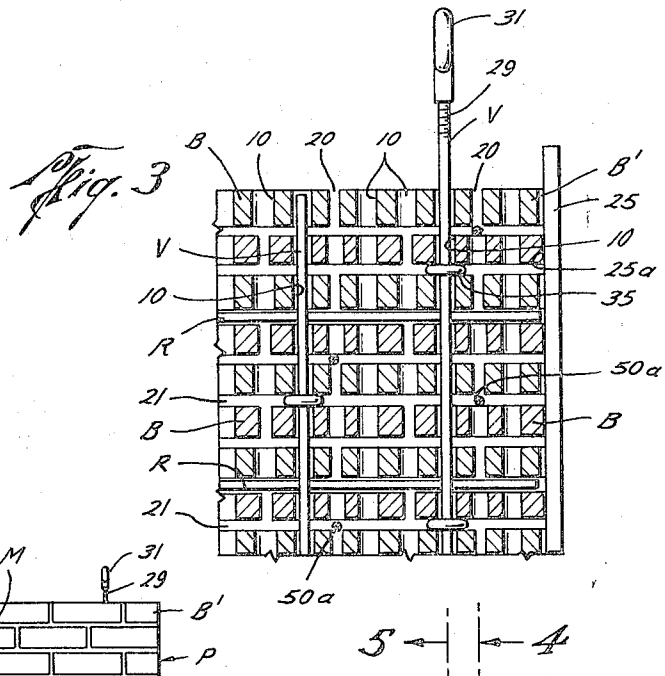
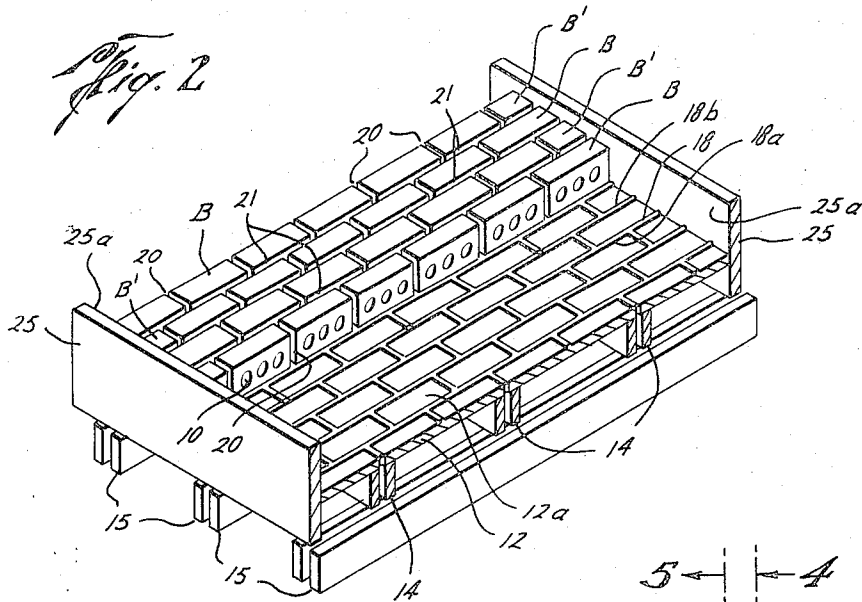
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7 Claims

ABSTRACT OF THE DISCLOSURE

A method for forming a masonry wall panel, wherein a plurality of bricks or similar wall-forming members are initially assembled in a substantially horizontal position in a predetermined pattern on a first clamping plate; reinforcing bars, rods or the like are disposed longitudinally and laterally so as to interfit with said bricks; a resilient layer is disposed over the surfaces of the bricks which are to serve as the wall exterior upon completion; the bricks are clamped in said predetermined pattern between the first clamping plate and a second clamping plate while still in the horizontal position; and thereafter the bricks in the clamped position are raised to a substantially vertical position and mortar is poured vertically between the first clamping plate and the resilient layer so as to fill the longitudinal and lateral spaces between the bricks; whereby upon the hardening of the mortar the bricks are in a pre-formed masonry wall panel which is removed from the clamping plates for mounting as a wall, or part of a wall, of a building or other structure.

BACKGROUND OF THE INVENTION

The field of this invention is methods and apparatus for forming masonry wall panels.

Due to the expense of laying bricks, one course at a time, much effort has been exerted in the past to try to economically and satisfactorily manufacture masonry wall panels from bricks or similar wall-forming members. Examples of such efforts are illustrated in U.S. Pats. Nos. 1,491,205; 2,698,536; 3,917,801; 3,231,646; 3,315,327; and 3,608,051. For the most part, the methods and apparatus of such prior art have been either uneconomical, too complex or unsatisfactory from the standpoint of the structural strength of the wall panel.

SUMMARY OF THE INVENTION

The present invention relates to methods and apparatus for forming masonry wall panels from bricks or similar wall-forming members, wherein the bricks are assembled horizontally on a first clamping plate in a predetermined pattern; reinforcing bars, rods or the like are disposed through aligned holes in the bricks and through spaces between courses of the bricks so as to interfit therewith; a resilient layer is disposed over the surfaces of the bricks which are to serve as the wall exterior upon completion; the bricks are then clamped between the first clamping plate and a second clamping plate while still in the horizontal position; and thereafter the bricks in the clamped position are raised to a substantially vertical position and mortar is poured vertically between the first clamping plate and the resilient layer so as to fill the spaces between the bricks; whereby upon the hardening of the mortar the bricks are in a pre-formed masonry wall panel which is removed from the clamping plates for mounting as a wall, or part of a wall, of a building or other structure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation of the brick wall panel made in accordance with the method of this invention, and using the apparatus of this invention;

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FIG. 2 is an isometric view of a portion of the apparatus of this invention, illustrating the initial steps in carrying out the method of this invention wherein the bricks are positioned substantially horizontally on a support plate in a predetermined pattern;

FIG. 3 is a view illustrating a portion of a brick wall panel at an intermediate stage of manufacture, using the process of this invention, with reinforcing rods shown disposed in aligned holes in the bricks vertically and also in lateral spaces between courses of the bricks;

FIG. 4 is a view illustrating the apparatus of this invention in a substantially vertical position after the bricks have been clamped between the clamping plates of the apparatus of this invention for the pouring of the mortar between the bricks, such view being taken on line 4—4 of FIG. 3;

FIG. 5 is a view taken on line 5—5 of FIG. 3 to further illustrate the relationship of the bricks and the reinforcing rod in the longitudinal and lateral spaces between the bricks to the pouring of mortar into the area between the clamping plates;

FIG. 6 is an isometric view illustrating one type of connector bolt disposed with the bricks during the formation of the wall panel; and

FIG. 7 is an isometric view illustrating a connector member which may be used in place of or in addition to the connector bolt shown in FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawings, the letter P designates generally a wall panel made from bricks B or other similar wall forming members, using the method and apparatus of this invention. The panel P may constitute the entire wall for one side or part of the building, or it may constitute only a portion of such a wall. The bricks B are joined together in the final assembly by mortar M which is disposed between the adjacent bricks in each course and also between each course of the bricks, in the well known manner. Reinforcing rods V extend substantially vertically through aligned openings 10 in the brick B, and reinforcing rods R extend substantially horizontally between certain of the courses of the bricks B in the wall panel P when it is in its final position (FIGS. 1 and 3).

Considering the method and apparatus of this invention more in detail, a first clamping plate or support plate 12, which may be made of heavy plywood or any other suitable material is disposed in a substantially horizontal position. The clamping plate 12 is preferably strengthened to prevent distortion thereof by longitudinally extending support bars or boards 14 which are nailed or are otherwise affixed to the clamping plate 12. Such boards 14 preferably extend for the full length of the clamping plate 12. Additional brace boards 15 extend laterally below the boards 14 and they may be secured thereto or they may be removably positioned with respect to the boards 14 for insertion at the time of clamping, as will be more evident hereinafter. The boards 14 and 15 may typically be wooden two-by-fours, but they may of course be of other materials or other sizes and still be within the scope of this invention.

The upper surface 12a of the clamping plate 12 is provided with a predetermined pattern formed by strips 18 of rubber, metal or any other material which are disposed longitudinally and laterally to define spaces 18a and 18b for positioning either a full brick B or a half brick B', respectively. Instead of using the strips of material 18 to form such predetermined pattern for the bricks B and the half bricks B' any other means may be provided such as projecting screws, preferably with rounded heads, which extend above the upper surface 12a of the clamping plate 12 to locate each brick so that there is a longitudinal space

20 between adjacent bricks in each course and a lateral space 21 between each course or row of the bricks.

A side plate 25 is secured to each side of the first clamping plate 12 by nails, screws or other attaching means and such side plates 25 extend upwardly from the plate 12 to a height at least equal to the upper level of the bricks B when they are positioned on the surface 12a of the plate 12. Such plates 25 serve as the outer lateral limits for the bricks B and the half bricks B' and normally, the outer bricks and half bricks engage the inner surfaces 25a of such end plates 25. Also, the end plates 25 normally extend above the upper surfaces of the bricks B and the half bricks B' so as to receive a resilient flexible sheet 30 and a second clamping plate 33 between the inner surfaces 25a of the opposite end plate 25, as will be more evident hereinafter.

After the bricks have thus been positioned on the clamping plate 12 in the predetermined pattern determined by the pattern of the strips 18 or screws or other suitable means forming same, the vertical reinforcing rods V are positioned through aligned holes or openings 10 in the bricks B (FIG. 3). Although any arrangement of the holes 10 may be utilized, it is found that it is desirable and satisfactory to provide bricks B which have two or three holes 10 so that when the bricks are offset approximately one-half of a brick on each course, the opposite end openings 10 of the bricks disposed above and below each other are in longitudinal alignment, as best seen in FIG. 3. The half bricks B' are usually made by splitting full size bricks B having two or three holes 10 so that each half brick B' has only one full hole 10. The vertical reinforcing rods V or any other suitable reinforcing material may be disposed in such aligned openings in the bricks B as shown in FIG. 3. Preferably at least two of such reinforcing rods V usually at the outer extremities of the panel P are of greater length than the rest of the reinforcing rods V and they are extended above the course of bricks which becomes the upper course as indicated by the threaded extension 29 visible in FIGS. 3 and 5, which is adapted to receive an eye member 31 or any other suitable hook means to facilitate the lifting of the panel P after it has been completed, as will be more evident hereinafter.

Laterally extending reinforcing rods or bars R are disposed at certain lateral spaces 21 between the course of the bricks and they may be disposed above and below the vertical rods V when the rods are initially assembled in the horizontal position so that the reinforcing rods R are disposed on each side of the vertical rods V in the final panel P (FIGS. 4 and 5).

Also, to facilitate the attachment of the panel P to a structural support such as vertical steel channel members or other building structure, connector members 35 (FIGS. 3, 5 and 6) are disposed between certain courses of the bricks and the spaces 21. For example, the connector member 35 illustrated in the drawings in FIG. 6 has an eye 35a, through which one of the vertical rods V extends to facilitate the positioning of the connector member 35 at the proper position with respect to the bricks B. Openings 12b of a size just large enough to accommodate the shank of the connecting members 35 are provided, through which such connecting members 35 extend as seen in FIG. 5. The openings 12b should not be excessively large so that they will not permit the mortar to flow therethrough when it is subsequently poured into the area with the bricks as will be explained.

An alternate form of the connector member 35 is a connector plate 37 shown in FIGS. 5 and 7 and it is provided with a plurality of openings 37a, each of which is adapted to receive therethrough a vertical reinforcing rod V (FIG. 5). Each plate 37 may have only one of such rods V (FIG. 5). Each plate 37 may have only one of such rods V extending therethrough, or it may have two or more of same extending therethrough. The rods V position the plates 37 to prevent them from being pulled

laterally from the panel P after the assembly has been completely manufactured, and the plates 37 project through openings 12c in the plate 12 which again are only large enough to accommodate the portions of the plates 37 extending therethrough so that mortar does not escape through such openings 12c when it is subsequently poured. The plates 37 are suitable for welding to or otherwise connecting to structural members of a building which have been positioned for the attachment of the panel P to the structure, as will be understood by those skilled in the art. The connector members 35 are preferably threaded at 35a so that they may be connected to the structural members of the building by passing through holes in the structural members and using nuts or other threaded connectors to make the connection. It would be appreciated that the connectors 35 may be used exclusively, or the connector plates 37 may be used exclusively, or they may be used alternately as illustrated in FIG. 5 or in any other predetermined pattern or arrangement for making suitable connections.

After all of the reinforcing members V and R, and the connectors 35 and/or 37 are suitably disposed with respect to the bricks B and the half bricks B', the resilient flexible sheet 30 is disposed over the upper surfaces of the bricks B and the half bricks B'. In the preferred embodiment, the sheet 30 is a foam rubber material, although it may be any other suitable resilient material which is yieldable and deformable so as to bulge inwardly into the spaces 20 and 21 as shown in FIGS. 4 and 5 to shape the mortar at such spaces so that it appears to be a doweled joint upon completion of the panel P.

The second clamping plate 33 is preferably the same as the first clamping plate 12 and is formed of plywood or other similar material. It may of course be formed of metal or any other material so long as it has sufficient strength to be clamped in position for holding the bricks in accordance with the method of this invention. The clamping plate 33 is also preferably strengthened at suitable intervals by longitudinally extending boards 38 which are preferably arranged so as to correspond with the boards 14 for the plate 12. Laterally extending boards 40 are also utilized above the board 38 and these preferably correspond in arrangement and number with the boards 15.

While the plates 12 and 33 and the bricks are still in the substantially horizontal position, the plates 12 and 33 are clamped together, using clamping connector bolts 50, which are preferably of the type known as "she" bolts. The plates 12 and 33 have holes 12d and 33a therethrough in alignment with each other which are just large enough to receive the central small section 50a of each of the bolts 50. Each of the bolts 50 includes a central small rod 50a which is threaded at each end into a tubular outer bolt member 50b which has threads 50c for receiving a nut 50d thereon. A washer 50e is also utilized with each of the threaded ends 50c. Thus, one of the bolt sections 50b is threadedly connected to the central threaded rod 50a and then the threaded rod 50a is pushed through the openings 12d and 33a so its threads at the other end are exposed for receiving the other threaded section 50b which is then threaded thereto. The threaded section 50b extends between the opposite pairs of brace boards 15 and 40 and the washers 50e are disposed in contact with such boards 15 and 40 so as to span the gap therebetween. The nuts 50d are then threaded onto the threads 50c and are tightened to bring the plates 33 and 12 together and to clamp the bricks therebetween, while also deforming the resilient foam rubber sheet 30 so as to cause it to bulge inwardly as illustrated in FIGS. 4 and 5 into the longitudinal and lateral openings 20 and 21 between the bricks. It will be appreciated that the nuts 50d will be tightened uniformly and throughout the entire group of the bolts 50 so as to apply the clamping and pressure force therefrom uniformly to the plates 33 and 12. It is to be noted that the

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bolts 50 extend into the intermediate portions of the plates 12 and 33 and are not confined to the outer extremities thereof and they are preferably uniformly distributed throughout the entire areas of such plates 33 and 12 so as to prevent any buckling of the plates 33 and 12 during the tightening action by the bolts 50 with the nuts 50d. The intermediate bolt rods 50a extend through the lateral courses 21 between the bricks B as well as through the holes 12d and 33a. Also, holes are formed through the resilient yieldable sheet 30 for such bolt rods 50a.

After the plates 12 and 33 have thus been clamped tightly enough together so that the bricks B and the half bricks B' cannot slip relative to the plates 12 and 33, the entire apparatus together with the bricks are raised to the substantially vertical position shown in FIGS. 4 and 5. The lower ends of the clamping plates 12 and 33 may have an end board 60 fastened thereto, or they may simply be positioned on a base which is not attached to the plates 12 and 33. Mortar to form the mortar joints M of FIG. 1 is then poured into the open area at the upper ends of the plates 12 and 33 by any suitable means such as indicated schematically by the hopper 61 in FIG. 4. The mortar flows downwardly between the first clamping plate 12 and the resilient sheet 30 by following the spaces 20 between adjacent bricks and also the holes 10 in the bricks themselves. The mortar is thin enough so that it may flow by gravity downwardly and fill all of the spaces 20, 21 and the openings 10 in the bricks.

After the mortar has been set so that it is hard, the bolts 50 may be removed by unthreading the nuts 50d with the plate 33 and then unthreading the bolt section 50b with such plate 33 so that the opposite bolt section 50b and the rod 50a may be pulled from the clamping plate 12. This will leave a small hole in the mortar where the rod 50a was positioned, but such hole is insignificant in the final structure and it may be closed by mortar manually at a later time if this is considered desirable. Usually, such hole furnishes a breather opening and is considered advantageous. It would be appreciated that all of the she bolts 50 are removed in the same manner and after they have been removed, then the plate 33 and the flexible sheet 30 may be removed. Prior to the removal of such plate 33, it is desirable to engage the hooks or eyes 31 with a cable or other supporting member so that the panel P is then supported and can be moved from the other clamping plate 12 to any desired location for storage or immediate installation as a wall or as a portion of a wall. The connector members 35 and 37 may be then attached to previously installed construction members, as previously explained.

Although the invention has been described herein, using specific materials and steps, it should be understood that variations may be made in the materials and the steps within the spirit of this invention as claimed herein.

What is claimed is:

1. A method of forming a masonry wall panel of bricks suitable for field assembly of the panels or the like, comprising:

initially laying a plurality of bricks, each having holes therethrough, on a first substantially horizontal clamping plate and in courses arranged in a predetermined pattern with lateral and longitudinal spaces between the adjacent bricks with said holes being substantially horizontal;

placing a flexible sheet over said bricks so as to cover all of said bricks and the spaces therebetween; positioning a second clamping plate on said flexible sheet;

inserting a plurality of clamps through both of said clamping plates, said flexible sheet and the spaces between said bricks;

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clamping said clamping plates together with the inserted clamps to firmly grip the bricks between said plates with the flexible sheet in contact with said bricks; thereafter moving the clamping assembly of the bricks, flexible sheet, and clamping plates, to a substantially vertical position to position said holes in said bricks substantially vertical; and

pouring mortar into the area between the first clamping plate and said flexible sheet and through said holes while the clamping assembly is substantially vertical so as to cause the mortar to flow by gravity to fill all of said lateral and longitudinal spaces between the adjacent bricks.

2. The method set forth in claim 1, including:

positioning said openings in at least some of said bricks in alignment for facilitating the flow of the mortar by gravity to fill said longitudinal and lateral spaces between said bricks.

3. The method set forth in claim 2, including:

inserting reinforcing rods through at least some of said aligned openings in said bricks prior to pouring the mortar.

4. The method set forth in claim 3, including:

inserting reinforcing rods into the lateral spaces between certain of the courses of the bricks prior to placing said flexible sheet over the bricks.

5. The method set forth in claim 1, wherein:

said flexible sheet is yieldable and sufficient clamping pressure is applied thereto when clamping said clamping plates to cause slight bulges of said sheet at and into the lateral and longitudinal spaces between said bricks for shaping the mortar between said bricks.

6. The method set forth in claim 1, wherein said step of inserting comprises:

inserting the clamps at a plurality of points throughout said clamping plates intermediate the sides thereof for distributing the clamping force to the clamping plates substantially uniformly and thereby preventing buckling of the plates at the intermediate areas thereof.

7. The method set forth in claim 1, including:

removing one of the clamping plates from the bricks; and

thereafter moving the bricks adhered together with the mortar as a wall panel from the other of said panels to position same as a free standing panel which may be used to form a wall or a portion of a wall.

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U.S. Cl. X.R.

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